

Co-Packaged Optics & Optical Interconnects

Patent Landscape Analysis – 2026

Who are the key players and newcomers in the global IP race shaping the future of optical communication in semiconductor packaging?

REPORT OUTLINE

- CPO & Optical Interconnects
- Patent Landscape Analysis
- January 2026
- PDF > 80 slides
- Excel file > 1,300 patent families
- Reference: KM26001
- 4,990 EUR for a multi-user license



KEY FEATURES

- **Global patenting trends**, including time evolution of patent publications, countries of patent filings, etc.
- **Main patent assignees and IP newcomers**
- Key players' **IP position** and the relative **strength** of their patent portfolio.
- **IP leadership evolution** of patent assignees since 2020.
- **IP profile of key players** (patent portfolio overview, technical coverage, geographical coverage, notable patents, recent IP activity)
- **Excel database** containing all patents analyzed in the report, including hyperlinks to an **updated online database**.

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[Hybrid Bonding Patent Landscape Analysis 2024](#)

Co-packaged optics is now a key enabler of next-gen electronics

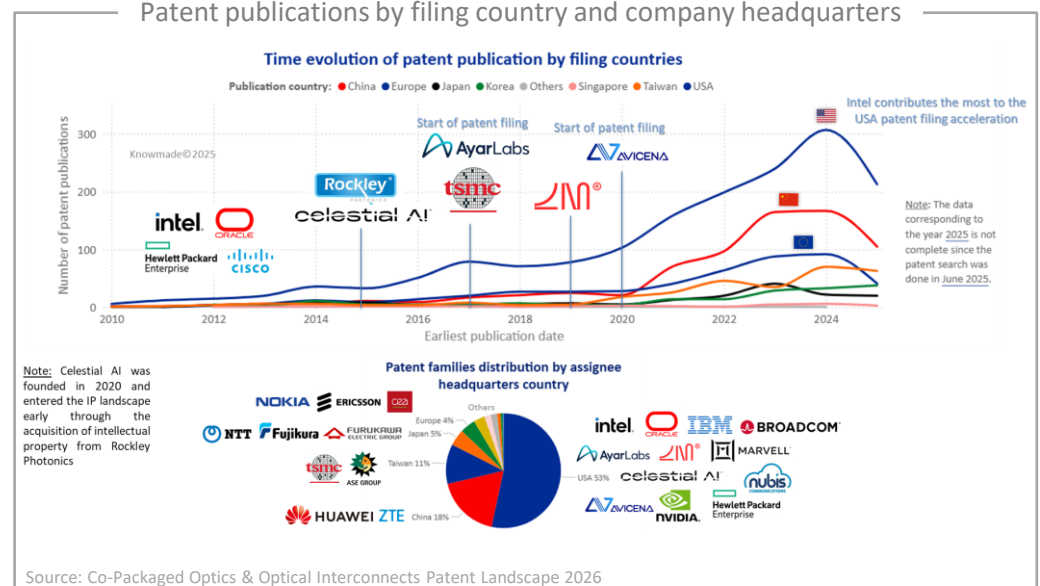
Artificial intelligence (AI) is reshaping industries at their core, fueling unprecedented data growth and accelerating the demand for energy-efficient computing. As data volumes surge, hardware innovation has become essential, particularly in rethinking data center architectures to deliver faster computation, lower power consumption, higher performance, and reduced latency. In this context, silicon photonics has emerged as a pivotal technology, replacing traditional copper interconnects with high-speed, light-based data transmission. As demand for data-intensive computing continues to rise, the semiconductor industry has built a substantial portfolio of patents aimed at integrating photonic and electronic systems at the package level. Together, these inventions highlight the industry's transition from conventional electrical interconnects to optical input/output (I/O) architectures that unlock higher bandwidth, lower latency, and improved energy efficiency across compute and networking platforms. Among the most significant advances is **Co-Packaged Optics (CPO)**, an innovative packaging approach that brings optical components directly into or near electronic devices to maximize efficiency and scalability.

Over the past 10 years, **CPO and optical I/O** technologies has become a key enabler of advanced semiconductor packaging, leading to a strong increase in patenting activity and a significant evolution of the competitive intellectual property (IP) landscape. **Major patent owners** have strengthened their IP positions in the US, China, and Europe, while **pure players have entered the patent landscape**. It is now crucial for companies operating in the semiconductor advanced packaging industry to closely examine the technology and competitive landscape from an IP perspective.

In this context, **Knowmade** is releasing a **new patent landscape report** to map the patent activity and competitive dynamics shaping this rapidly evolving field. Over **4,000 individual patents** from more than **1,300 patent families** (inventions) have been selected. This report aims to provide insights into current IP activities, the positions of key IP players, the applications they target in their patents, and how their patent portfolios can support their market strategies.

Co-Packaged Optics & Optical Interconnects

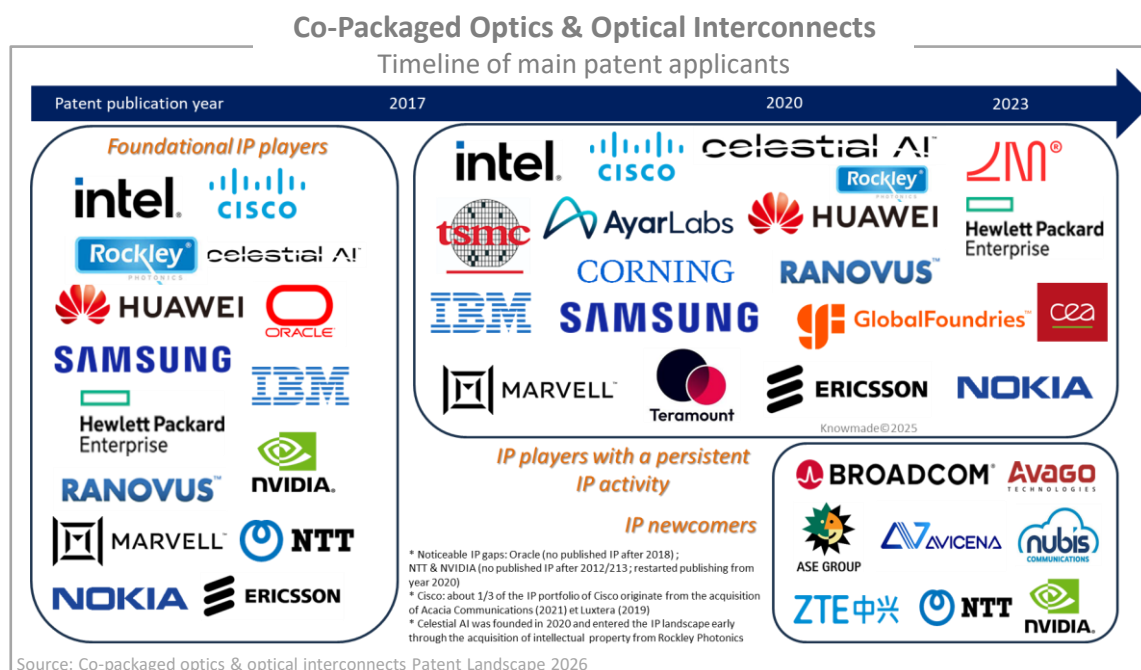
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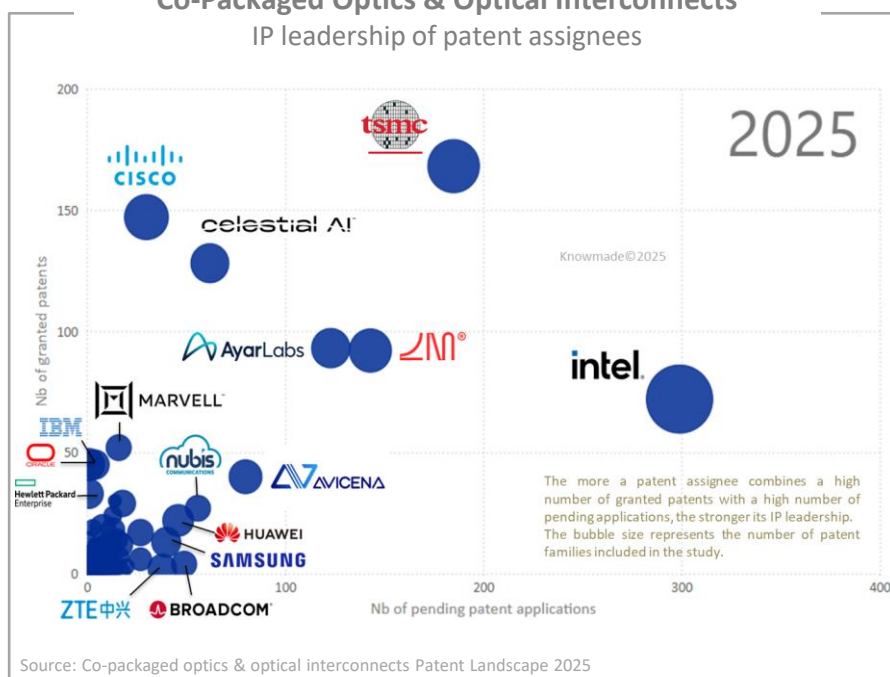
Understanding the main trends, the key players' IP position and IP strategy

Through patent analysis, we describe the position of IP players, unveil their strategies to strengthen their IP portfolio, highlight their capability to limit the patenting activity and freedom-to-operate of other firms, identify promising new players, and forecast what would be the future IP leaders. IP competition analysis should reflect the vision of players with a strategy to enter and develop their business in the **advanced semiconductor packaging** market.

In this report, we provide a comprehensive overview of the competitive IP landscape and latest technological developments related to **CPO and optical I/O** technology. The report covers **IP dynamics** and **key trends** in terms of patents applications, patent assignees, filing countries, patented technologies, and targeted applications. It also identifies the **IP leaders**, most **active patent applicants**, and sheds light on **under-the-radar companies and new players** in this field. Besides, we have identified **over 270 key inventions** that are most critical in terms of geographic coverage in key technology markets.



Co-Packaged Optics & Optical Interconnects IP leadership of patent assignees



A dynamic IP landscape: evolution of leading players' positions and pure players

TSMC and Intel are leading the patent landscape, increasing patenting activity, and expanding invention protection in key countries. As pioneer Intel has adopted an aggressive strategy to assert its patents. Later TSMC and pure players (Lightmatter, Celestial AI, Ayar Labs, Avicena Tech) joined the IP landscape and developed strategic portfolios.

In recent years, more IP players have become involved in the IP landscape, and OSATs and materials suppliers have entered the IP arena.

In this report, we provide an overview of the IP portfolios held by the key players emerging from the IP landscape and describe the related inventions and technologies.



Useful Excel patent database

This report includes an extensive **Excel database with** all patents analyzed in this study, including **patent information** (numbers, dates, assignees, title, abstract, legal status, etc.) and **hyperlinks to an updated online database** (original documents, legal status, etc.).

Companies mentioned in the report (non-exhaustive)

Intel, TSMC, Huawei, Broadcom, Cisco, Lightmatter, Avicena, Celestial AI, Rockley Photonics, Ayar Labs, Ranovus, Samsung Group, NVIDIA, Teramont, ZTE, Resonac, Marvell, Nokia, Oracle, Micron, Senko Group, VTT, Alphabet, Accelink Technologies, Ruijie Networks, Eliyan, Mitsubishi Electric, LIPAC, RTX Corporation, HP - Hewlett Packard Development, UniC (Tsinghua Unigroup), Yangzhou Xinli Integrated Circuit, Juniper, Suzhou Singularity Photon Intelligent Technology, Huagong Tech, NCAP, CEA, ASTAR, Sumitomo Electric, JCET Group, Apple, GlobalFoundries, ASE Group, Nubis communications, Amkor Technology, Lightelligence, Zhejiang Lingxin Optoelectronics Technology, Corning, Zhongshan Meisu Technology, Nano Photonics, Guangbenwei Technology, Wuxi institute of interconnect technology, Li Hong Electronic, Yongjiang Laboratory, SMIC, Tsinghua University, Sky Semiconductor, Elphic, Lightip Technologie, NTT - Nippon Telegraph & Telephone, Innolux, Shanghai Xizhi Technology, United Test and Assembly Center, University College Cork, Lumentum, Hanyang University, Furukawa Electric, Raytek, Hangzhou Guangzhiyuan Technology, Dongguan Luxshare Technology, PICadvanced, SPIL, Wuhan Optics Valley Information Optoelectronics Innovation Center, MACOM Technology Solutions, Ciena, MaxLinear, AIP - Advanced Integrated Photonics, Lyte AI, Browave, Xunyun Electronic Technology, Xperi/Adeia, HKUST - Hong Kong University of Science And Technology, ITRI - Industrial Technology Research Institute.

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AUTHORS**Dr. Pauline Calka**

Pauline works for Knowmade as a patent analyst in the fields of semiconductor manufacturing and advanced packaging. She holds a PhD in Memory from the University of Grenoble Alpes (France), in partnership with the CEA-Leti (France). After an Alexander von Humboldt Postdoc fellowship position at the Technical University of Berlin (Germany) and the Leibniz Institute for High Performance Microelectronics on ReRAM development, Pauline worked five years at ASM International (Belgium) as Senior Process Engineer on thin film development for logic, memory and MEMS, and two years at CEA-Leti as Integration Engineer on imaging CMOS sensors.

Contact: pauline.calka@knowmade.fr

**Dr. Nicolas Baron**

Nicolas is CEO and co-founder of Knowmade. He manages the development and strategic orientations of the company and personally leads the Semiconductor department. He holds a PhD in Physics from the University of Nice Sophia-Antipolis, and a Master of Intellectual Property Strategies and Innovation from the European Institute for Enterprise and Intellectual Property (IEEPI) in Strasbourg, France.

Contact: nicolas.baron@knowmade.fr

ABOUT KNOWMADE

KnowMade is a technology intelligence and IP strategy firm specializing in the analysis of patents and scientific publications. We assist innovative companies, investors, and research organizations in understanding the competitive landscape, anticipating technological trends, identifying opportunities and risks, improving their R&D, and shaping effective IP strategies.

KnowMade's analysts combine their strong technology expertise and in-depth knowledge of patents with powerful analytics tools and methodologies to transform patent and scientific data into actionable insights to support decision-making in R&D, innovation, investment, and intellectual property.

KnowMade has solid expertise in Semiconductors and Packaging, Power Electronics, Batteries and Energy Management, RF and Wireless Communications, Photonics, MEMS, Sensing and Imaging, Medical Devices, Biotechnology, Pharmaceuticals, and Agri-Food.

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“Acceptance”: Action by which the Buyer accepts the terms and conditions of sale in their entirety. It is done by signing the purchase order which mentions “I hereby accept KnowMade’s Terms and Conditions of Sale”.

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“Seller”: Based in Sophia Antipolis (France headquarters), KnowMade is a technology intelligence company specialized in the research and analysis of scientific and technical information. We provide patent landscapes and scientific state of the art with high added value to businesses and research laboratories. Our intelligence digests play a key role to define your innovation and development strategy.

1. Scope

1.1 The Contracting Parties undertake to observe the following general conditions when agreed by the Buyer and the Seller. Any additional, different, or conflicting terms and conditions in any other documents issued by the buyer at any time are hereby objected to by the seller, shall be wholly inapplicable to any sale made hereunder and shall not be binding in any way on the seller.

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